REMARKS

This paper is responsive to the Office Action mailed April 30, 2003 in connection with the above-identified patent application. In that Action, claims 55-57, 61-63, and 67-69 were rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 5,978,796 to Malloy, et al. Claims 58, 59, 64, 65, 70, and 71 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Malloy, et al. in view of U.S. Patent No. 6,381,605 to Kothuri, et al. Lastly, claims 60, 66, and 72 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Malloy, et al. further in view of U.S. Patent No. 6,094,651 to Agrawal, et al. That Action was made final.

The Present Application:

For purposes of review, the present application relates to a method, an apparatus, and an article of manufacture providing for the creation and use of an index to access a subject multi-dimensional database. An embodiment of the invention receives an indication of a number of features of a subject multi-dimensional database to be identified, and then performs feature identification on the subject multi-dimensional database. An index for accessing the subject multi-dimensional database is created using the identified number of features. The index itself may be a multi-dimensional database.

As described in the specification on page 11, beginning at line 18:

> In order to create the index, the Index System 124 passes the indexing parameters 128 to feature identification software 122 for use in finding "features" in the subject multi-dimensional database 136. Then, the Index System finds the "features" with the feature identification software 122. Next, the Index System builds the index

134 using the features as points for indexing into the subject multi-dimensional database 136. Then, the Index System 124 provides navigation capabilities for navigating the index 134 to access the subject multi-dimensional database 136.

The invention provides a user interface to set up definitions for the subject multi-dimensional database to be mined, dimensions to be mined, measures to be mined, mining technique (i.e., feature identification) parameters, and numoer of results to be stored. The user interface directly drives a mining run. Additionally, the invention supports traversal of the multi-dimensional database, execution of the mining technique, and generation of result data. In one embodiment, the mining technique scans the subject multi-dimensional database and the result data is used to create an incex. Operations for creating and deleting the index are provided as well as for outline definition, data population, cell note creation, and link partition definition. The invention provides capabilities for exploration and visualization of the result data against the subject multi-dimensional database.

Overall, the invention automatically builds the index, along with links to the subject multi-dimensional database. The invention also stores the index data in a spreadsheet data file, so that a spreadsheet user could view a list of deviations in one spreadsheet and link to cells in the subject multi-dimensional database using a linked partition mechanism.

There are many advantages to the invention including its straightforward implementation. Also, the invention does not require any additional functions or support from the developers of the subject multi-dimensional database, it does not modify the existing subject multi-dimensional database, and it does not store extra data in the subject multi-dimensional database. Extra explanations are

selectively stored as cell notes on the index as desired, providing visualization and navigation of the multi-dimensional data. Furthermore, the invention is easily managed and can be applied with any data mining technique that can identify point of interest in a multi-dimensional database (i.e., a feature identification technique). The infrastructure of the invention supports plug-in techniques and can extend the solution beyond deviation detection.

U.S. Patent No. 5,978,796 to Malloy, et al.:

U.S. Patent No. 5,978,796 to Malloy, et al. teaches a method, apparatus, and article of manufacture for using a relational database management system (RDBMS) to support on-line analytical processing (OLAP) systems. As noted in the background of the Malloy, et al. '796 patent, RDBMS software has typically been used with databases comprised of traditional data types that are easily structured into tables. However, RDBMS products have limitations with respect to providing users with specific views of data. Accordingly, "front-ends" have been developed for RDBMS products so that data retrieved from the RDBMS can be aggregated, summarized, consolidated, summed, viewed, and analyzed. These "front-ends" do not, however, easily provide the ability to consolidate, view, and analyze data in the manner of "multi-dimensional data analysis." This type of functionality is also known as on-line analytical processing (OLAP).

Accordingly, therefore, the Malloy, et al. '796 patent proposes to emulate a multi-dimensional database using a relational database. Another object is to provide a relational database implementation of a multi-dimensional database using a star schema. Still further, another object of the Malloy, et al. '796 patent is to map data blocks of a multi-dimensional database to rows in a relational database using a dimension identifier.

At a practical level, the Malloy, et al. '796 patent teaches a system which replaces the integrated multi-dimensional data storage manager of Arbor Software's Essbase OLAP software with a relational database storage manager based on IBM's DB2 RDBMS software. The relational database storage manager enables the OLAP system to store data directly into a relational database.

As noted at column 6, beginning at line 10 of the Malloy, et al. '796 patent, Figure 2 illustrates a conceptual multi-dimensional database used by the system for emulation. The emulated multi-dimensional database has a logical structure as shown in Figure 3.

Applicants respectfully direct the Examiner's attention to the Malloy, et al. '796 patent at column 8, beginning at line 17 whereat it is described that Figure 4 is a diagram that illustrates a structure for storing multi-dimensional data in a relational database structure. The data is stored in a star schema 400 in the relational database 118 as opposed to a specialized multi-dimensional data store as described in the '724 patent. It is further described there that in order to work correctly with Arbor Software's Essbase OLAP software, the storage manager 114 and DB2 server 116 of the Malloy, et al. system work together to emulate the structure and functions performed in the '724 patent, even though a different database is used to store the multi-dimensional data.

All Pending Claims are Patentably Distinct and Unobvious Over the References of Record:

Referring once again to the Office Action in greater detail, claims 55-57, 61-63, and 67-69 were rejected as being anticipated by U.S. Patent No. 5,978,796 to Malloy, et al. The Examiner took the position that the Malloy, et al. '796 patent teaches a method, apparatus, and article of manufacture of accessing a subject multi-dimensional database

stored on a data store connected to a computer.

Applicants respectfully disagree with the Examiner's understanding of the Malloy, et al. '796 patent. The Examiner took the position that the Malloy, et al. '796 patent teaches an apparatus and an article of manufacture "accessing a subject multi-dimensional database stored on a data store connected to a computer comprising:

a) receiving an indication of a number of features of said subject multi-dimensional database to be identified (column 2, lines 60-62);

b) performing feature identification to identify the indicated number of features (column 2, lines 62-65); and

c) creating an index for the subject multi-dimensional database using the identified number of features (column 6, lines 38-48)."

However, applicants respectfully submit that the Malloy, et al. '796 patent does not teach the above as suggested by the Examiner. Further, applicants submit that the Examiner has not met her prima facie burden of proof of anticipation as required by the law and rules. In support of applicants' position, it is to be noted that at column 2, lines 60-62 the Malloy, et al. '796 patent states:

> a dimension identifier is received that identifies a data block in a multi-dimensional database.

In addition, at column 2, lines 62-65, the Malloy, et al. '796 patent teaches:

> the dimension identifier comprises one or more multi-dimensional member identifiers.

Lastly, at column 6, lines 38-48, the Malloy, et al. '796 patent teaches:

> rows are accessed from the fact table

through the related dimension tables using the received dimension identifier.

For the convenience of the Examiner and for the record, applicants have prepared a table for side-by-side comparison of independent claim 55 against portions of the Malloy, et al. '796 patent relied upon by the Examiner as a reference anticipating the claim. As can be seen, there is no correspondence between the two. It is respectfully submitted that the claims are not anticipated or rendered obvious by the Malloy, et al. '796 patent.

Claim 15	Malloy, et al. '796
Receiving an indication of a number of features of said subject multi-dimensional database to be identified	A dimension identifier is received that identifies a data block in a multi-dimensional database
Performing feature identification to identify the indicated number of features	The dimension identifier comprises one or more multi-dimensional member identifiers
Creating an index for the subject multi-dimensional database using the identified number of features	Rows are accessed from the fact table through the related dimensional tables using the received dimension identifier

As can be seen from the above, the Malloy, et al. '796 patent does not teach, suggest, or fairly disclose receiving an indication of a number of features, performing feature identification to identify the indicated number of features, and creating an index for a multi-dimensional database using the identified number of features.

In addition to the above, the Examiner cites the Malloy, et al. '796 patent at column 6, lines 38-63 as a teaching of a step "wherein creating the index comprises creating a multi-dimensional database that is derived from the subject multi-dimensional database." For the convenience

of the Examiner and for clarifying the record, the Malloy, et al. '796 patent at column 6, lines 38-63 teaches:

> a dimension acts as an index for identifying values within the cube. If one member of the dimension is selected, then the remaining dimensions in which a range of members (or all members) are selected defines a sub-cube in which the number of dimensions is reduced by a one. If all but two dimensions have a single member selected, the remaining two dimensions define a spread sheet (or a "slice" or a "page"). If all dimensions have a single member selected, then a single cell is defined. Dimensions offer a very concise, intuitive way of organizing and selecting data for retrieval, exploration, and analysis.
>
> A single data point or cell occurs at the intersection defined by selecting one member from each dimension in a cube. In the example cube shown in Fig. 3, the dimensions are time, product, and measures. The cube is three-dimensional, with each dimension (i.e., time, product, and measures) represented by an axis of the cube. The intersection of the dimension members... are represented by cells in the multi-dimensional database that specify a precise intersection along all dimensions that uniquely identifies a single data point. For example, the intersection of cube 2308, product 314, and costs 326 contains the value, 369, representing the costs of all products in the second quarter of 1997.

Again, applicants respectfully submit that the above portion of the Malloy, et al. '796 patent does not teach, suggest, or fairly disclose a step wherein creating an index comprises creating a multi-dimensional database that is derived from a subject multi-dimensional database. (17)

Still further in the Action, claims 57, 63, and 69 were rejected because, according to the Examiner, the Malloy, et al. '796 patent further teaches receiving a number of

features to be identified by receiving a parameter value. The Examiner cites column 2, at lines 63-65 of the Malloy, et al. '796 patent. That portion of the Malloy patent was set out above and will not be repeated here. However, as can be seen, that portion of the Malloy, et al. '796 patent has nothing to do with receiving a number of features to be identified or receiving a parameter value.

Referring yet once again to the Office Action in greater detail, independent claims 55, 61, and 67 were indicated by the Examiner as being anticipated by the Malloy, et al. '796 patent as teaching a method, apparatus, and article of manufacture comprising receiving an indication of a number of features of a subject multi-dimensional database to be identified, performing feature identification to identify the indicated number of features, and creating an index for the subject multi-dimensional database using the identified number of features. Applicants again respectfully disagree with the Examiner's position regarding the Malloy, et al. '796 patent.

More particularly, it is respectfully submitted that the Malloy, et al. patent teaches emulating a multi-dimensional database using a relational database. The Malloy system replaces the integrated multi-dimensional data storage manager of Arbor Software's Essbase OLAP software with a relational database storage manager based on IBM's DB2 RDBMS software. The relational database storage manager enables the OLAP system to store data directly into a relational database.

The Malloy, et al. '796 patent does not teach, suggest, nor fairly disclose any aspects whatsoever related to "features" of a multi-dimensional database. As pointed out in the subject application at page 6, beginning at line 22, an index system 124 is invoked by an indexing parameter's collection GUI 104. Then, the index system 124 invokes feature identification software 122 and passes the indexing

parameters file 128 to the features identification software 122. The feature identification software 122 performs data mining to obtain a specified number of deviations for one or more members of the subject multi-dimensional database 136. In particular, the feature identification software retrieves data from the subject multi-dimensional database 136. The feature identification software 122 accesses the subject multi-dimensional database 136 via an OLAP client network interface 126 to interface with the OLAP server network interface 146 which in turn interfaces with an OLAP database system 138 in order to access the subject multi-dimensional database 136 and return data to the feature identification software 122 via the OLAP server network interface 146 and the OLAP client network interface 126.

Importantly, the feature identification software 122 returns data to the index system 124, which uses the returned data to create an index.

It is to be appreciated that, as pointed out beginning at the bottom of page 13 of the subject application, the feature identification software may use any technique that can identify specific points or regions of interest in a multi-dimensional database. The result is an ordered list of multi-dimensional points. Some feature identification techniques may have additional information about features, such as the dimension along which the feature is most apparent. The Malloy, et al. '796 patent simply does not utilize feature identification in a multi-dimensional database.

According to the above, therefore, applicants respectfully submit that the Malloy, et al. '796 patent does not teach, suggest, or fairly disclose the limitations recited in independent claims 55, 61, or 67 of the instant application. That reference does not teach storing a multi-dimensional database on a data store or accessing a stored multi-dimensional database. In addition, the patent cited by

the Examiner does not receive an indication of a number of features of a subject multi-dimensional database to be identified, nor does it perform feature identification on the subject multi-dimensional database to thereby create an index for the subject multi-dimensional database.

It is further respectfully submitted that neither the Kothuri, et al. '605 patent nor the Agrawal, et al. '651 patent teach, suggest, or fairly disclose the above limitations.

Further in the body of the Office Action, the Examiner took the position that "the number of features to be mined in the present invention is equivalent to prior art dimension identifiers which represent the points of interest or measures to be mined" (emphasis added). The Examiner makes the statement without supporting her position and particularly without identifying language or teachings in the reference which would support her position. On page 5, at lines 4 and 5 of the present application, mining technique parameters are identified as feature identification parameters. In addition, at the top of page 6 of the present application, it is indicated that the invention can be managed easily and can be applied with any data mining technique that can identify points of interest in a multi-dimensional database (i.e., a feature identification technique).

Still further on page 6, beginning at line 24, it is indicated that the feature identification software 122 performs data mining to obtain a specified number of deviations for one or more members of the subject multi-dimensional database. At the top of page 7, it is indicated that the feature identification software 122 returns data to the index system 124, which uses the returned data to create an index multi-dimensional database 134. Using the index multi-dimensional database 134, the index system 124 creates the deviations spread sheet 130. Lastly, on page 11,

beginning at line 20, it is indicated that the index system finds the "features" with the feature identification software 122. Next, the index system builds the index 134 using the features as points for indexing into the subject multi-dimensional database 136.

In accordance with the above, therefore, it is respectfully submitted that the features are first found and then the index system builds an index using the features as points for indexing into the subject multi-dimensional database. This is quite different from the Examiner's position that "the number of features to be mined in the present invention is equivalent to prior art dimension identifiers which represent the points of interest or measures to be mined." In the present application, the features are mined and then used by an index system. The Examiner's understanding is opposite and is to the effect that the features are equivalent to dimension identifiers.

For at least the above reasons, it is respectfully submitted that claims 55-57, 61-63, and 67-69 are patentably distinct and unobvious over the references of record. Additionally, dependent claims 58-60 and 64-66 are also respectfully submitted to the patentably distinct and unobvious over the art of record.

Conclusion

In view of the above remarks and arguments presented, it is respectfully submitted that all pending claims are in condition for allowance.

Allowance of all pending claims and early notice to that effect is respectfully requested.

Respectfully submitted,

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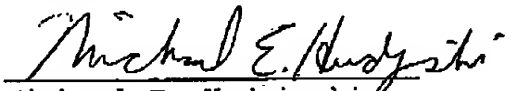

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